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document [The nature of X-ray selected EROs] The nature of X-ray selected EROs

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abstract We report on the X-ray, optical, near-infrared, submillimetre and radio properties of five Extremely Red Objects (EROs) selected at X-ray wavelengths by XMM-Newton in the Lockman Hole field. They all have enough counts in the X-ray band to allow spectral fitting: four are most probably obscured, Compton-thin AGN with redshift dependent absorbing column densities of $10^{22} - 10^{24}$ cm^{-2}, whilst the fifth is best fitted by a thermal spectrum and is likely to be a massive elliptical galaxy in a deep gravitational potential. Their optical/near-infrared colours and sizes suggest that X-ray selected EROs comprise a mixture of dusty 'starburst' galaxies and non-dusty galaxies that are dominated by either star-light or light from an active nucleus. The colour diagnostics are supported by the submillimetre and radio data: the two AGN with 'starburst' colours have submillimetre or radio flux densities that imply large star-formation rates, whilst those with 'elliptical' colours do not. The one source detected in the submillimetre waveband has narrow emission lines at a redshift of 1.45. Although the bulk of its radio emission originates from processes other than star formation, it is most probably a radio-quiet ultraluminous infrared galaxy.